

Tank Storage

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THE GATEWAY TO GERMANY'S ENERGY MARKET

A former refinery has emerged as a key coastal terminal
for the country's supply chain

A NEW PLAYER FOR THE UK'S GROWING STORAGE DEMAND

An exclusive interview with the UK's largest independent
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MIXERS PLAY A KEY ROLE IN THE PETROLEUM SUPPLY CHAIN

The criteria used by an Oklahoma refinery to update its mixing system

Many of the largest oil-consuming nations, such as the US, have topped 95% of their available crude oil storage capacity. Other nations such as India and Mexico are capitalising on current oil prices to ensure their own energy independence by launching new strategic petroleum reserve programmes. As a result, the need to manage crude oil storage is increasing everywhere around the globe.

With so much oil currently in storage, inventory management and speed of transport are important variables in the supply chain – particularly for refineries, where operators seek to maximise output, minimise costs, and ensure regulatory compliance.

Until crude oil can be refined, it must be stored. During this storage period, product consistency plays an important role in maximising recoverable hydrocarbon content. To ensure consistency, operators employ mixing technology to provide continual blending, which helps to maintain homogeneity for intermediate and finished products.

A US-based independent petroleum refiner, with operations throughout the mid-continent, southwestern and Rocky Mountains region, recently faced storage issues and needed to upgrade their mixers. They process close to half a million barrels of crude each day - refining it into petrol, diesel and jet fuel products, which are sold to customers throughout the US.

The refiner's Oklahoma operations have their own storage tanks. Working with Milton Roy Mixing, the operator outlined five criteria they used to select side entry mixers.

1) Managing BS&W

Bottom, sludge, and water (BS&W) is the term used to describe impurities that accompany crude oil when it is stored in tanks. When crude comes out of the ground, it is accompanied by sand, salt and other debris. Water gets added to the crude to facilitate easier pumping into the pipeline. These impurities are removed during the refining process, but until the crude is refined, BS&W poses a wasteful risk for storage tanks.

Over time, if enough BS&W settles on the bottom of a tank, a process called 'sanding-in' takes place, which can reduce the capacity of a storage tank by up to 30%. Excessive BS&W accumulation can also degrade the

integrity of the tank's bottom, creating an environmental hazard. The only way to address these issues is to empty the tank and conduct a lengthy, expensive and environmentally challenging cleanup. Such cleanups, which require specialised equipment and expertise, can cost hundreds of thousands of dollars. The downtime and the opportunity loss that accompanies a tank cleanup must be avoided at all costs.

The way to manage BS&W is to keep it in suspension until the crude is ready for refining. This is accomplished by attaching side entry mixers to storage tanks, which keep the crude moving in the tank and prevent BS&W from settling at the tank's bottom. Mounted on the lateral flange of the tank, side-entry mixers with light-weight, small diameter impellers provide consistent fluid motion for optimal product homogeneity and velocity distribution.



The 4 Blade Sabre Impeller delivers the highest flow at the lowest horsepower

2) Performance – greater blending capacity increases production. Refinery constraints can have a direct impact on price volatility. As a result, mixers used to prepare the feedstocks can have a direct impact on the plant's productivity.

Good flow patterns are essential to optimising fluid flows and maintaining tank integrity.

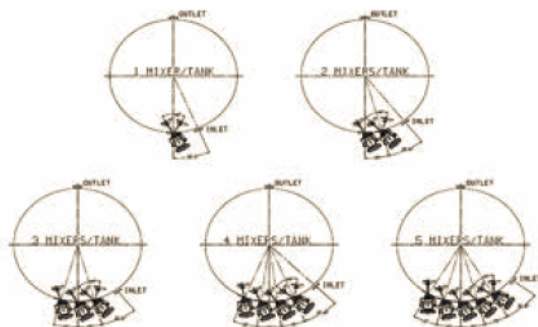
To ensure proper agitation, Milton Roy Mixing conducted a series of computational fluid dynamics tests based on the volume of crude stored in the tank as well as the crude's gravity and viscosity to determine the optimal configurations for the mixers.

Prior to this simulation, the Oklahoma refinery used marine-style, three blade mixers, which required more horsepower to deliver the required mixing intensity and fluid velocity. But after upgrading to the 4-blade Sabre impeller and grouping together the side entry mixers into the optimal orientation, they were able to increase fluid velocity distribution and minimise blending time without requiring more horsepower. The improved blending helped them increase working volumes and reduce stock dilution.

3) Energy savings

Energy costs are one of the largest expenses for refineries, and they are also an expense that every refinery looks to reduce.

The side entry mixer helps to minimise energy costs in two areas: The Sabre impeller provides the highest flow at the lowest horsepower, which delivers a 20% energy savings over marine-style three blade impellers. Beyond its efficiency, the performance capabilities also foster energy savings, because the equipment does not need to operate as long to complete the required blending activities.



The optimal configuration for mixers is determined through computational fluid dynamics tests based on the volume of crude stored as well as the crude's gravity and viscosity

4) Simplified maintenance

When mixing technology fails or requires repairs, the maintenance or replacement can be costly. More importantly, equipment repairs mean downtime, and they can also hinder product quality. In order to manage storage inventory, the refinery required equipment with reliable operation and minimal maintenance.

Milton Roy Side entry mixers minimise vibration. The mixer’s inboard spherical roller bearing can withstand greater radial loads, and it does not wear out as quickly as mixers that feature conical roller bearings or deep groove ball bearings. As a result, the mixer requires less maintenance and fewer re-alignments than other types of mixers.

Vibration is also reduced due to the articulated motor support, which enables a fast belt and motor de-assembly and re-assembly. The simple design features a single set screw for tensioning the belt, which does not require a senior skilled technician to maintain.

The side entry mixer is simple to install – due to a small diameter for the Sabre impeller. It is easily inserted into the tank, and just as easily removed, because the impeller diameter is smaller than the flange’s inside diameter, further enhancing maintenance requirements.

5) Safety

The safety of employees, contractors and the neighboring community are core values for the refinery, and it was essential that the mixer design align with the company’s business values.

The side entry mixer features a shut off device that enables tank operators to safely replace the mixer’s mechanical seal quickly and easily, even if the tank is full. Fast and efficient shut off actuation capabilities also help to ensure limited environmental impact, by lessening the potential for oil spills or leaks.

The design of the Milton Roy mixer minimises the risk of the agitator impeller hitting the inside wall of the tank while it is running. This

reduces the probability that the impeller could get loose and fall to the bottom of the tank, which would require draining the tank for repairs, or it could require a diver to enter the hazardous environment. Either option is expensive, and potentially dangerous. But the mixer’s design ensures greater safety and reliability, while essentially reducing the risks of running the mixer improperly.

CONCLUSION

With these goals in mind – enhanced blending performance; greater energy efficiency; simplified maintenance; better reliability/safety; and a more effective means of keeping BS&W suspended in the tank - the refiner replaced its older mixers with newer Milton Roy side entry mixers. The results have enhanced the Oklahoma plant’s output and reduced its operating expenses.

The evaluation the Oklahoma plant conducted is being considered by refineries all around the globe, as part of efforts to enhance efficiencies and reduce costs.

But refineries are not the only ones examining the effectiveness of their legacy mixers. Tank farms remain the most interested constituents in mixing technology, because global production continues to outpace demand, storage capacity remains at its highest point, and energy costs constitute the single largest expense for tank farm and pipeline operators.

Legacy mixers are being upgraded around the globe with newer side-entry mixers, which help minimise BS&W issues, maximise storage capacity, and enhance the operator’s bottom line in the process.

FOR MORE INFORMATION

This article was written by Gilles Meny, global product line manager and Steven Raynor, US sales manager at Milton Roy Mixing. www.miltonroy.com/MiltonRoy/en/Products/Mixers



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